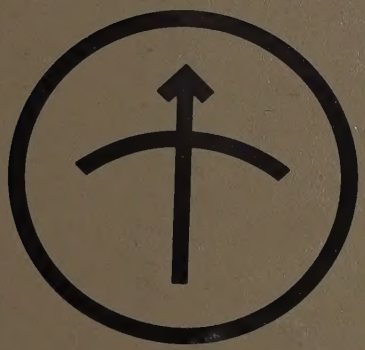
MODEL M-600
ATTENUATOR

Operating INSTRUCTIONS



MP MASTER
MA25201

MEASUREMENTS
A McGRAW-EDISON DIVISION
BOONTON NEW JERSEY

MODEL M-600
ATTENUATOR

Operating INSTRUCTIONS

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M-600 ATTENUATOR

I. GENERAL

The M-600 Attenuator is a 50-ohm step attenuator arranged to provide 100 db of attenuation in 1 db increments through the use of nine steps of attenuation. The steps of attenuation consist of Pi networks of resistors properly adjusted and compensated to provide the correct attenuation at low and high frequencies. The resistors are of the precision film type. Break-before-make switches with good high-frequency characteristics are used. Each Pi network and its associated switch is mounted in a shielded compartment in order to insure correct attenuation and impedance characteristics. The M-600 is mounted in a well-shielded brass case.

II. SPECIFICATIONS

a.	Input Impedance:	50 ohms.
b.	Output Impedance:	50 ohms.
c.	Maximum Attenuation:	100 db.
d.	Attenuation Steps:	20, 20, 20, 20, 10, 5, 2, 2 1 db.
e.	Attenuation Accuracy:	0.1 db/db at 200 Mc: 0.15 db/db at 500 Mc; greater accuracy at lower frequencies. Resistors of 1% accuracy are used throughout.
f.	Frequency Range:	DC to 500 Mc.
g.	Maximum Power:	0.5 watt input.
h.	Insertion Loss:	Less than 1 db at 150 Mc, less than 4 db at 400 Mc.
i.	Connectors:	BNC type UG-625/U.
j.	Dimensions:	11" L. x 1-15/16" W. x 2" H., overall.
k.	Weight:	1-1/2 pounds.

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III. USES

a. The M-600 Attenuator is useful in making gain and loss measurements on amplifiers, transformers and filters. It also serves as the attenuator for signal generators, pulse generators and similar instruments not equipped with an attenuator. It facilitates the calibration and checking of attenuators and gain controls.

IV. OPERATION

a. All connections to the M-600 attenuator should preferably be made with RG-58 c/u or similar 50-ohm cable.

b. A particular step of attenuation is inserted in the circuit by placing the corresponding switch lever in the "IN" position. The remaining switches are left in the "OUT" position. The sections are inserted in tandem so that the total attenuation is the sum of the individual attenuation steps placed in the "IN" position. For example, 33 db attenuation is obtained by placing the 20 db, 10 db, 2 db and 1 db switch levers in the "IN" position.

c. The total input signal power plus any direct current which may be simultaneously connected to the input should not exceed 1/2 watt. The direct current may be removed by the use of a blocking capacitor, if necessary.

V. MAINTENANCE

a. The user is strongly advised to return the M-600 to Measurements if it becomes necessary to replace resistors which may have been damaged.

b. To open the M-600 attenuator for service purposes, remove the twelve sheet metal screws around the edges of the cover. Carefully remove the cover.

c. Replacement resistors may be obtained from Measurements.

d. When resistors are soldered in place, it is imperative that the original lead dress be maintained.

e. The 1 db, 2 db, 5 db, 10 db and 20 db attenuation steps employ capacitive compensation. If the resistors are replaced in the 20 db steps, the small copper strap around the 248-ohm resistor must be adjusted to provide 20 db of attenuation at 500 Mc, if the original accuracy is to be preserved above 200 Mc.

TABLE VI

CONVERSION TABLE

Attenuator Decibels to Voltage and Power Ratios

DB	VOLTAGE RATIO	POWER RATIO
0	1.0000	1.000
1	.8913	.7943
2	.7943	.6310
3	.7079	.5012
4	.6310	.3981
5	.5623	.3162
6	.5012	.2512
7	.4467	.1995
8	.3981	.1585
9	.3548	.1259
10	.3162	.1000
11	.2818	.0794
12	.2512	.0631
13	.2239	.0501
14	.1995	.0398
15	.1778	.0316
16	.1585	.0251
17	.1413	.0200
18	.1259	.0159
19	.1122	.0126
20	.1000	.0100

FOR VALUES GREATER THAN 20 DB

To Add 20 DB To Any Of The Above Values Multiply The Voltage Ratio by .1 And Power Ratio By .01.

To Add 40 DB: Voltage Ratio x 10^{-2} Power Ratio x 10^{-4}

To Add 60 DB: Voltage Ratio x 10^{-3} Power Ratio x 10^{-6}

To Add 80 DB: Voltage Ratio x 10^{-4} Power Ratio x 10^{-8}

To Add 100 DB: Voltage Ratio x 10^{-5} Power Ratio x 10^{-10}

TABLE OF REPLACEABLE PARTS

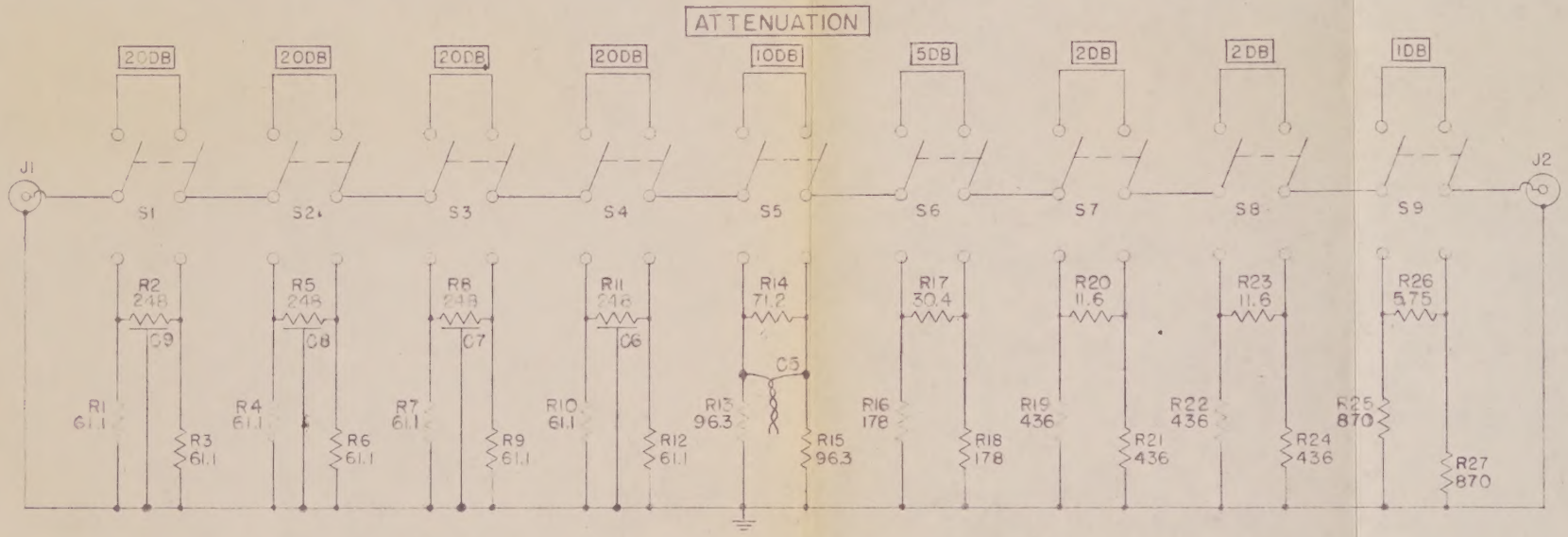
M-600 Attenuator

Symbol	Measurements Part Number	Description
C1		
C2		
C3		
C4		
C5		Capacitor; adj.; wire lead.
C6		Capacitor; adj.; copper strap.
C7		Capacitor; adj.; copper strap.
C8		Capacitor; adj.; copper strap.
C9		Capacitor; adj.; copper strap.
J1		Connector; UG-625/U.
J2		Connector; UG-625/U.
R1	H-4882-40	Resistor; fixed; film 61.1 ±1%, 1/2 W.
R2	H-4882-35	Resistor; fixed; film 248 ± 1%, 1/2 W.
R3	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R4	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R5	H-4882-35	Resistor; fixed; film 248 ± 1%, 1/2 W.
R6	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R7	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R8	H-4882-35	Resistor; fixed, film 248 ± 1%, 1/2 W.
R9	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R10	H-4882-40	Resistor; fixed; film 61.1 ± 1%, 1/2 W.
R11	H-4882-35	Resistor; fixed; film 248 ± 1%, 1/2 W.
R12	H-4882-40	Resistor; fixed; film 61.1± 1%, 1/2 W.

Symbol	Meas. Pt. No.	Description
R13	H-4882-41	Resistor, fixed; film 96.3 ± 1%, 1/2 W.
R14	H-4882-36	Resistor, fixed; film 71.2 ± 1%, 1/2 W.
R15	H-4882-41	Resistor, fixed; film 96.3 ± 1%, 1/2 W.
R16	H-4882-42	Resistor, fixed; film 178 ± 1%, 1/2 W.
R17	H-4882-37	Resistor, fixed; film 30.4 ± 1%, 1/2 W.
R18	H-4882-42	Resistor, fixed; film 178 ± 1%, 1/2 W.
R19	H-4882-43	Resistor, fixed; film 436 ± 1%, 1/2 W.
R20	H-4882-38	Resistor, fixed; film 11.6 ± 1%, 1/2 W.
R21	H-4882-43	Resistor, fixed; film 436 ± 1%, 1/2 W.
R22	H-4882-43	Resistor, fixed; film 436 ± 1%, 1/2 W.
R23	H-4882-38	Resistor, fixed; film 11.6 ± 1%, 1/2 W.
R24	H-4882-43	Resistor, fixed; film 436 ± 1%, 1/2 W.
R25	H-4882-44	Resistor, fixed; film 870 ± 1%, 1/2 W.
R26	H-4882-39	Resistor, fixed; film 5.75 ± 1%, 1/2 W
R27	H-4882-44	Resistor, fixed; film 870 ± 1%, 1/2 W.
S1	H-6639	Switch; toggle DPDT.
S2	H-6639	Switch; toggle DPDT.
S3	H-6639	Switch; toggle DPDT.
S4	H-6639	Switch; toggle DPDT.
S5	H-6639	Switch; toggle DPDT.
S6	H-6639	Switch; toggle DPDT.
S7	H-6639	Switch; toggle DPDT.
S8	H-6639	Switch; toggle DPDT.
S9	H-6639	Switch; toggle DPDT.

SCHEMATIC DIAGRAM

PART Nº. M-600



XXX : FRONT PANEL CONTROL

UNLESS OTHERWISE SPECIFIED:

ALL RESISTORS 0.5 WATT

ALL RESISTANCES IN OHMS

REV.	DESCRIPTION	DATE
C	CHANGE R 2 VALUE	
B	ADDED C & THRU 2 CAPAC.	6-30-67

DWN. BY	DATE	CHK. BY	APPD. BY

SCALE ~ DO NOT SCALE

MATERIAL ~

FINISH ~

TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMALS ± .005 FRACTIONS ± 1/64

MEASUREMENTS CORPORATION
BOONTON, N. J.

TITLE DIAGRAM SCHEMATIC,

DWG. NO B-6484-C

PART Nº. M-600, DWG. M-600

B-6484-C

FORM NO. 145

ALBANENE 1951 19580

MEASUREMENTS

BOX 180, BOONTON
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